NeoBiota 56: 27–29 (2020)
doi: 10.3897/neobiota.56.51823
http://neobiota.pensoft.net

COMMENTARY

A peer-reviewed open-access journal
NeoBiota
Advancing research on alien species and biological invasions

Don't throw the baby out with the bathwater – ban of glyphosate use depends on context

Jan Pergl[1], Handrij Härtel[2], Petr Pyšek[1,3], Robert Stejskal[4]

1 *Czech Academy of Sciences, Institute of Botany, Department of Invasion Ecology, CZ-252 43 Průhonice, Czech Republic* **2** *Bohemian Switzerland National Park, Pražská 52, CZ-407 46 Krásná Lípa, Czech Republic* **3** *Department of Ecology, Faculty of Science, Charles University, Viničná 7, CZ-128 44 Prague 2, Czech Republic* **4** *Podyjí National Park Administration, Na Vyhlídce 5, CZ-669 02, Znojmo, Czech Republic*

Corresponding author: Jan Pergl (jan.pergl@ibot.cas.cz)

Academic editor: I. Kühn | Received 6 March 2020 | Accepted 7 March 2020 | Published 23 April 2020

Citation: Pergl J, Härtel H, Pyšek P, Stejskal R (2020) Don't throw the baby out with the bathwater – ban of glyphosate use depends on context. NeoBiota 56: 27–29. https://doi.org/10.3897/neobiota.56.51823

Recently, Science journal published a letter entitled "Support Austria's glyphosate ban" (Peng et al. 2020) where the authors argue that the usage of glyphosate should cease. They propose that other weed-killing alternatives such as root exudates, crop rotation or mulch be used instead. We agree that risks associated with using this herbicide on a large scale exist, but on a small scale, such as in invasive plants control, glyphosate has an important role and is not easy to replace. Therefore, the context and scale need to be taken into account when applying such bans.

Many aggressively resprouting invasive trees and shrubs, e.g. *Robinia pseudoacacia* (black locust), *Ailanthus altissima* (tree of heaven), or *Acacia* (acacias) can only be effectively eradicated by combining mechanical and herbicide treatments (Dufour-Dror 2013; Krumm and Vítková 2016). Local conditions also limit the use of some methods. Recommended mechanical girdling without herbicide treatment and leaving standing trees to avoid the root resprouting (Vítková et al. 2017) is not suitable for public forests where falling branches may cause serious injuries (Sádlo et al. 2017).

For many herbaceous plants, e.g. *Heracleum mantegazzianum* (giant hogweed), *Fallopia* sp. (knotweeds; syn. *Reynoutria*) or *Rumex alpinus* (monk's rhubarb), the sensible application of herbicides is an effective method of control, because mechanical removal is not feasible (e.g. Bímová et al. 2001; Csiszár and Korda 2017). Such need for herbicide combination with mechanical methods is reported from many regions

Copyright *Jan Pergl et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

and for many species (e.g. Burn et al. 2003; Nielsen et al. 2007; Csiszár and Korda 2017). A European-wide example is that of knotweeds (*Fallopia* sp.) where mechanical methods include regular cutting with removal of aboveground biomass. Unfortunately, this approach does not lead to eradication; it only lowers the impact and needs to be repeated each year. An alternative option is to dig out the rhizomes which is resource- and labour-demanding if done properly. Both these methods are associated with the need to remove and transport the biomass which can lead to further spread. Spraying with herbicides thus offers much more efficient control of the invaded sites (Jones et al. 2018). In large infestations, the foliar spraying of herbicides is recommended in the first season, followed by spot application or injection to stems or rhizomes. Of course, if foliar spraying is the only option for invasive species management, then selective herbicides should be used as a first option as they allow for faster regeneration of the surrounding vegetation, hence reducing the reinvasion.

The situation is different for annual plant species, such as *Impatiens glandulifera* (Himalayan balsam), where the use of herbicides is not needed as the plants can be destroyed mechanically by pulling due to their weak root system. Such an approach allows for the eradication of large infestations effectively, rapidly and without any side effects to co-occurring biota (Saegesser et al. 2016).

We agree that to minimize the side effects on biodiversity and human well-being, large-scale spraying using a huge amount of herbicides in agriculture needs to be dramatically reduced. However, spot application and other direct methods used for invasive plants control (e. g. hack-and-fill, drill-and-fill, cut-stump) must remain as an option because other effective control methods are currently unavailable.

Herbicides other than glyphosate are very similar in their rate of degradation in soil, mobility and potential abilities to contaminate e.g. water; their effects on nature are comparable and some of them, which might replace glyphosate in the future, have a much less favourable ecotoxicological profile (Burn et al. 2003). It also needs to be considered that a complete ban on glyphosate or similar herbicides might lead to the resignation of some stakeholders regarding the control of invasive species. Thus we call for a balanced approach to the use of herbicides, taking into account the context of an environmental problem in question. Agriculture, as the largest user of herbicides, and nature conservation have different goals that require different methods to achieve. It is necessary to distinguish between application of herbicides for economic reasons such as in large-scale agriculture, and for nature conservation purposes including the control of invasive species representing one of the major threats to biodiversity as identified by many managers (Pyšek et al. 2013).

Acknowledgements

J.P. and P.P. were supported by project 17–19025S and EXPRO grant 19–28807X (Czech Science Foundation) and long-term research development project RVO 67985939 (Czech Academy of Sciences).

References

Bímová K, Mandák B, Pyšek P (2001) Experimental control of *Reynoutria* congeners: a comparative study of a hybrid and its parents. In: Brundu G, Brock J, Camarda I, Child L, Wade M (Eds) Plant invasions: Species ecology and ecosystem management. Backhuys Publishers, Leiden, 283–290.

Burn A, Wills M, Bacon J, Jefferson R, Roworth P (2003) The Herbicide Handbook: Guidance on the use of herbicides on nature conservation sites. English Nature 2003 in association with FACT.

Csiszár A, Korda M (2017) Practical experiences in invasive alien plant control. 2nd revised and expanded edition. Rosalia Handbooks. (Duna–Ipoly National Park Directorate Duna–Ipoly National Park Directorate Budapest.

Dufour-Dror JM (2013) Guide for the control of invasive trees in natural areas in Cyprus: Strategies and technical aspects. Department of Forests, Republic of Cyprus, 25 pp.

Jones D, Bruce G, Fowler MS, Law-Cooper R, Graham I, Abel A, Street-Perrott FA, Eastwood D (2018) Optimising physiochemical control of invasive Japanese knotweed. Biological Invasions 20: 2091–2105. https://doi.org/10.1007/s10530-018-1684-5

Krumm F, Vítková L (Eds) (2016) Introduced tree species in European forests: opportunities and challenges. European Forest Institute.

Nielsen C, Vanaga I, Triekale O, Priekule I (2007) Mechanical and chemical control of *Heracleum mantegazzianum* and *H. sosnowskyi*. In: Pyšek P, Cock MJW, Nentwig W, Ravn HP (Eds) Ecology and Management of Giant Hogweed (*Heracleum mantegazzianum*), CAB International, Wallingford, 226–239. https://doi.org/10.1079/9781845932060.0226

Peng W, Lam SS, Sonne C (2020) Support Austria's glyphosate ban. Science 367: 257–258. https://doi.org/10.1126/science.aba5642

Pyšek P, Genovesi P, Pergl J, Monaco A, Wild J (2013) Plant invasions of protected areas in Europe: an old continent facing new problems. In: Foxcroft LC, Pyšek P, Richardson DM, Genovesi P (Eds) Plant invasions in protected areas: patterns, problems and challenges. Springer, Dordrecht, 209–240. https://doi.org/10.1007/978-94-007-7750-7_11

Sádlo J, Vítková M, Pergl J, Pyšek P (2017) Towards site-specific management of invasive alien trees based on the assessment of their impacts: the case of *Robinia pseudoacacia*. NeoBiota 35: 1–34. https://doi.org/10.3897/neobiota.35.11909

Saegesser J, Fischer D, Fischer K (2016) Long-term control of *Impatiens glandulifera* in a Swiss forest: does zero-tolerance pay off? In: Ries C, Krippel Y (Eds) Biological invasions: interactions with environmental change. Book of abstracts. NEOBIOTA 2016 – 9th International Conference on Biological Invasions. Fondation faunefloreе, Vianden, 69.

Vítková M, Müllerová J, Sádlo J, Pergl J, Pyšek P (2017) Black locust (*Robinia pseudoacacia*) beloved and despised: a story of an invasive tree. Forest Ecology and Management 384: 287–302. https://doi.org/10.1016/j.foreco.2016.10.057